Requirements and Architecture

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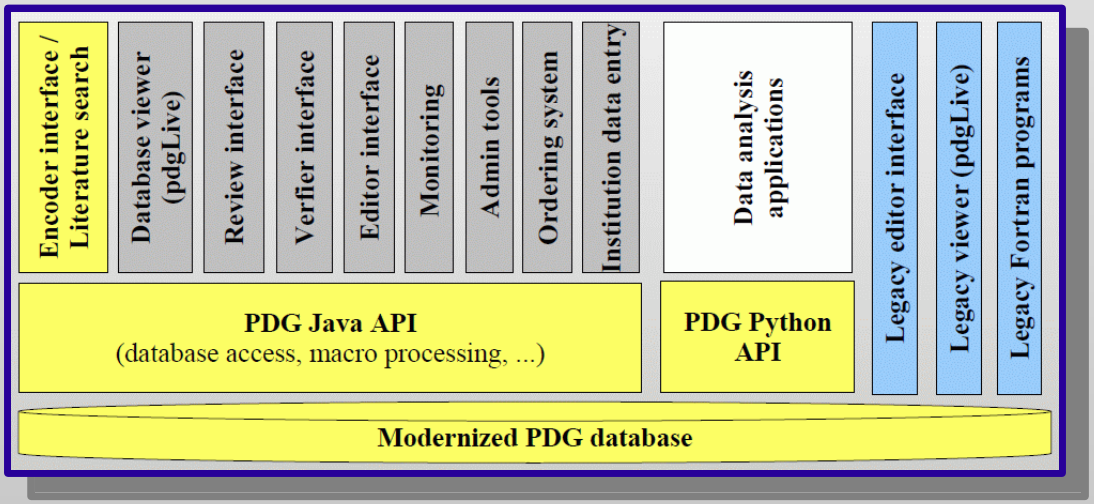


Outline:

- Applications
- Architecture
- System and components
- Technologies
- Cross-linking with other systems

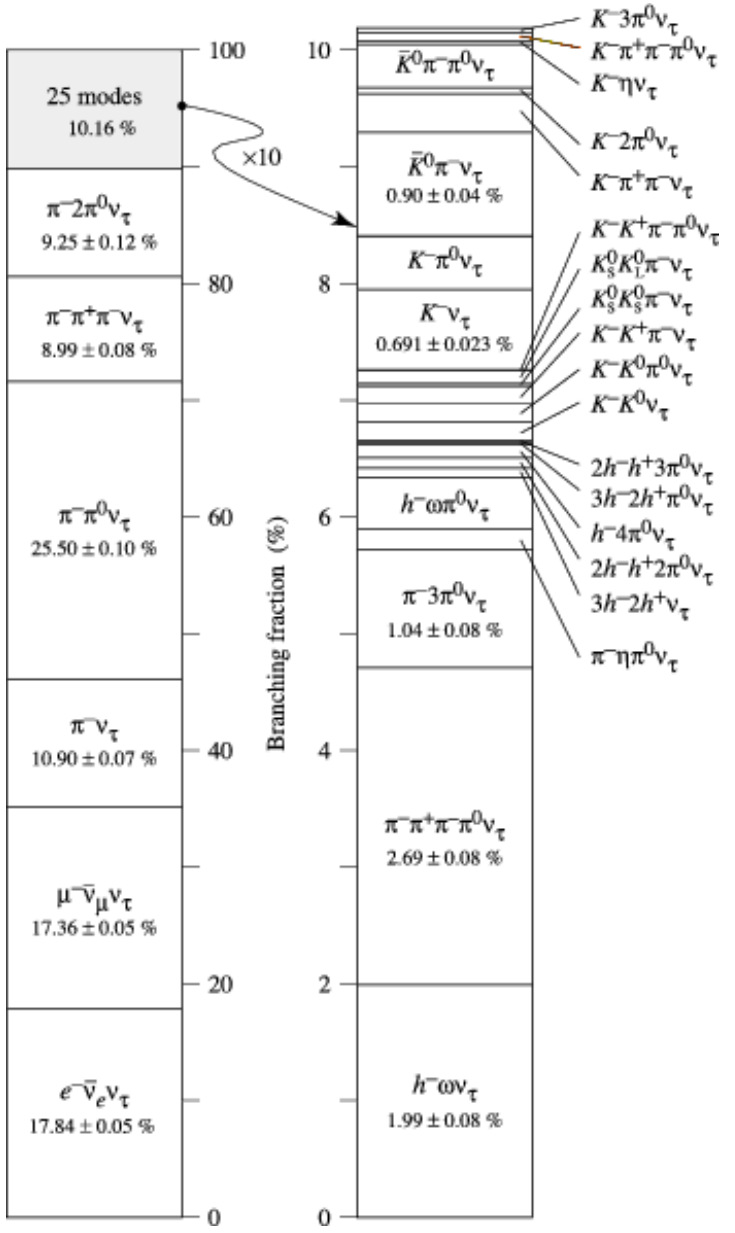
Listings with Complex Fits

τ^- DECAY MODES

τ^+ modes are charge conjugates of the modes below. "$h^\pm$" stands for $\pi^\pm$ or $K^\pm$. "ℓ" stands for e or μ. "Neutrals" stands for γ's and/or π^0's.

	Mode		Fraction (Γ_i/Γ)	Scale factor/ Confidence level
	Modes with one charged particle			
Γ_1	particle$^-$ ≥ 0 neutrals $\geq 0K^0\nu_\tau$ ("1-prong")		(85.33 ± 0.08) %	S=1.4
Γ_2	particle$^-$ ≥ 0 neutrals $\geq 0K^0_L\nu_\tau$		(84.69 ± 0.09) %	S=1.4
Γ_3	$\mu^-\overline{\nu}_\mu\nu_\tau$	[a]	(17.36 ± 0.05) %	
Γ_4	$\mu^-\overline{\nu}_\mu\nu_\tau\gamma$	[b]	(3.6 ± 0.4) × 10^{-3}	
Γ_5	$e^-\overline{\nu}_e\nu_\tau$	[a]	(17.84 ± 0.05) %	
Γ_6	$e^-\overline{\nu}_e\nu_\tau\gamma$	[b]	(1.75 ± 0.18) %	
Γ_7	$h^- \geq 0K^0_L\ \nu_\tau$		(12.14 ± 0.07) %	S=1.1
Γ_8	$h^-\nu_\tau$		(11.59 ± 0.06) %	S=1.1
Γ_9	$\pi^-\nu_\tau$	[a]	(10.90 ± 0.07) %	S=1.1
Γ_{10}	$K^-\nu_\tau$	[a]	(6.91 ± 0.23) × 10^{-3}	
Γ_{11}	$h^- \geq 1$ neutrals ν_τ		(37.05 ± 0.12) %	S=1.3
Γ_{12}	$h^- \geq 1\pi^0\nu_\tau$ (ex.K^0)		(36.51 ± 0.12) %	S=1.3
Γ_{13}	$h^-\pi^0\nu_\tau$		(25.95 ± 0.10) %	S=1.1
Γ_{14}	$\pi^-\pi^0\nu_\tau$	[a]	(25.50 ± 0.10) %	S=1.1
Γ_{15}	$\pi^-\pi^0$ non-$\rho(770)\,\nu_\tau$		(3.0 ± 3.2) × 10^{-3}	
Γ_{16}	$K^-\pi^0\nu_\tau$	[a]	(4.52 ± 0.27) × 10^{-3}	
Γ_{17}				=1.5
Γ_{18}				=1.3
Γ_{19}				=1.3
Γ_{20}				=1.3
Γ_{21}				95%
Γ_{22}				95%
Γ_{23}				
Γ_{24}	$h^- \geq 3\pi^0\nu_\tau$		(1.33 ± 0.07) %	S=1.1
Γ_{25}	$h^- \geq 3\pi^0\nu_\tau$ (ex. K^0)		(1.25 ± 0.07) %	S=1.1
Γ_{26}	$h^-3\pi^0\nu_\tau$		(1.17 ± 0.08) %	S=1.1
Γ_{27}	$\pi^-3\pi^0\nu_\tau$ (ex.K^0)	[a]	(1.04 ± 0.08) %	S=1.1
Γ_{28}	$K^-3\pi^0\nu_\tau$ (ex.K^0, η)	[a]	(4.2 ± 2.1) × 10^{-4}	
Γ_{29}	$h^-4\pi^0\nu_\tau$ (ex.K^0)		(1.6 ± 0.4) × 10^{-3}	
Γ_{30}	$h^-4\pi^0\nu_\tau$ (ex.K^0,η)	[a]	(1.0 ± 0.4) × 10^{-3}	
Γ_{31}	$K^- \geq 0\pi^0\ \geq 0K^0\ \geq 0\gamma\ \nu_\tau$		(1.57 ± 0.04) %	S=1.1
Γ_{32}	$K^- \geq 1$ (π^0 or K^0 or γ) ν_τ		(8.78 ± 0.33) × 10^{-3}	

- **Total of 214 τ decay modes**
- **82 branching fractions determined from constrained fit using 31 basis modes**



PDG particle data group

Review Articles

10. ELECTROWEAK MODEL AND

Revised September 2005 by J. Erler (U. Mexico) and P. Langacker (Univ. of Pennsylvania).

10.1 Introduction
10.2 Renormalization and radiative corrections
10.3 Cross-section and asymmetry formulae
10.4 Precisio
10.5 W and Z

The Cabibbo Angle and CKM Unitarity

. Blucher [1] and W.J. Marciano [2]

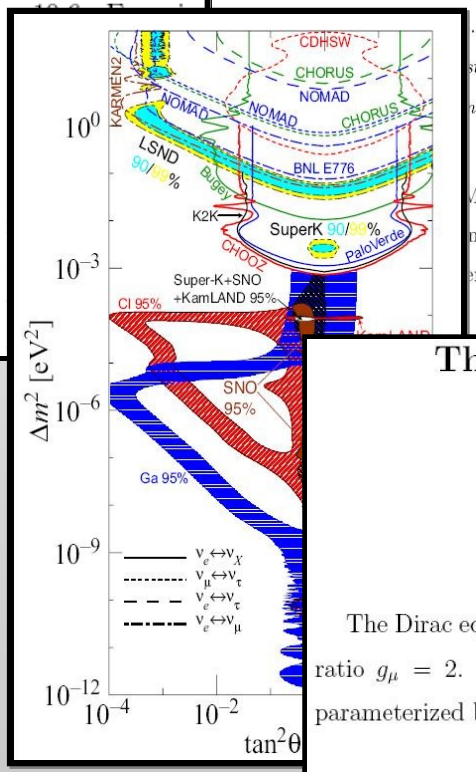
stitute, The University of Chicago, Chicago, Ill

n National Laboratory, Upton, New York 1197

Maskawa (CKM) [1, 2] 3-generation quark m

n parameters (λ, A, ρ, η) [3] nicely illustrates

ntral role played by λ.



The Muon Anomalous

Andreas Höcker[1] and Will

[1] *CERN, CH-1211 Geneva*

[2] *Brookhaven National Laboratory,*

The Dirac equation predicts a muon magnetic m
ratio $g_\mu = 2$. Quantum loop effects lead to a s
parameterized by the anomalous magnetic momen

$$a_\mu \equiv \frac{g_\mu - 2}{2}$$

LAWRENCE BER

REVIEWS, TABLES, AND PLOTS

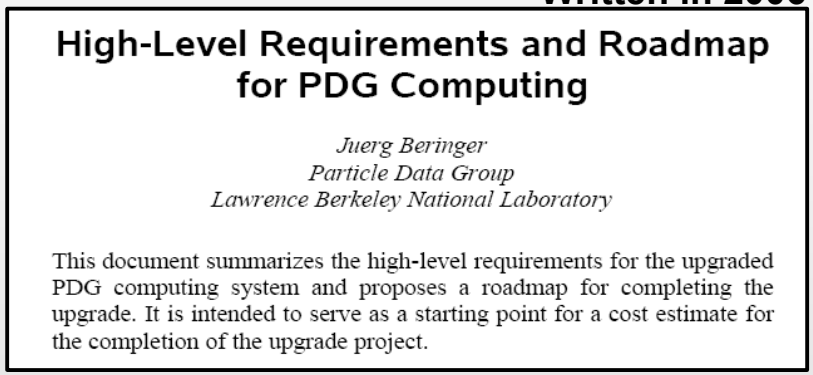
MAJOR REVIEWS IN THE PARTICLE LISTINGS

Additional Reviews and Notes related to specific particles are located in the Particle Listings.

Requirements Specification

- **High-level requirements document**
- **Additional requirements documents where needed**
  - Ordering system
  - Review interface
  - ...
- **Current applications / prototypes developed earlier by Kirill and Slava Lugovsky**
  - Editor interface
  - PdgLive
  - Encoder interface prototype
- **Close interaction with PDG**

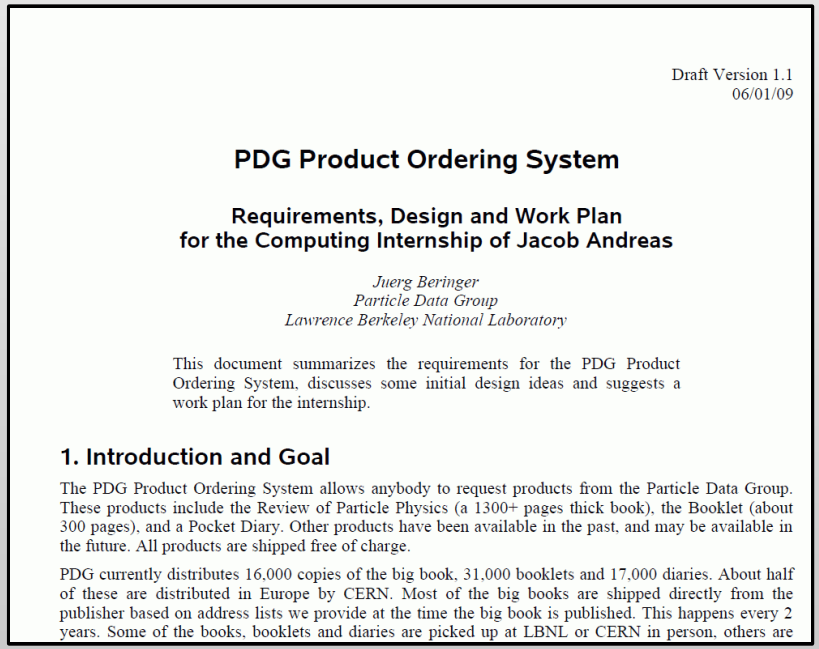
Written in 2006



High-Level Requirements and Roadmap for PDG Computing

Juerg Beringer
Particle Data Group
Lawrence Berkeley National Laboratory

This document summarizes the high-level requirements for the upgraded PDG computing system and proposes a roadmap for completing the upgrade. It is intended to serve as a starting point for a cost estimate for the completion of the upgrade project.



Draft Version 1.1
06/01/09

PDG Product Ordering System

Requirements, Design and Work Plan
for the Computing Internship of Jacob Andreas

Juerg Beringer
Particle Data Group
Lawrence Berkeley National Laboratory

This document summarizes the requirements for the PDG Product Ordering System, discusses some initial design ideas and suggests a work plan for the internship.

1. Introduction and Goal

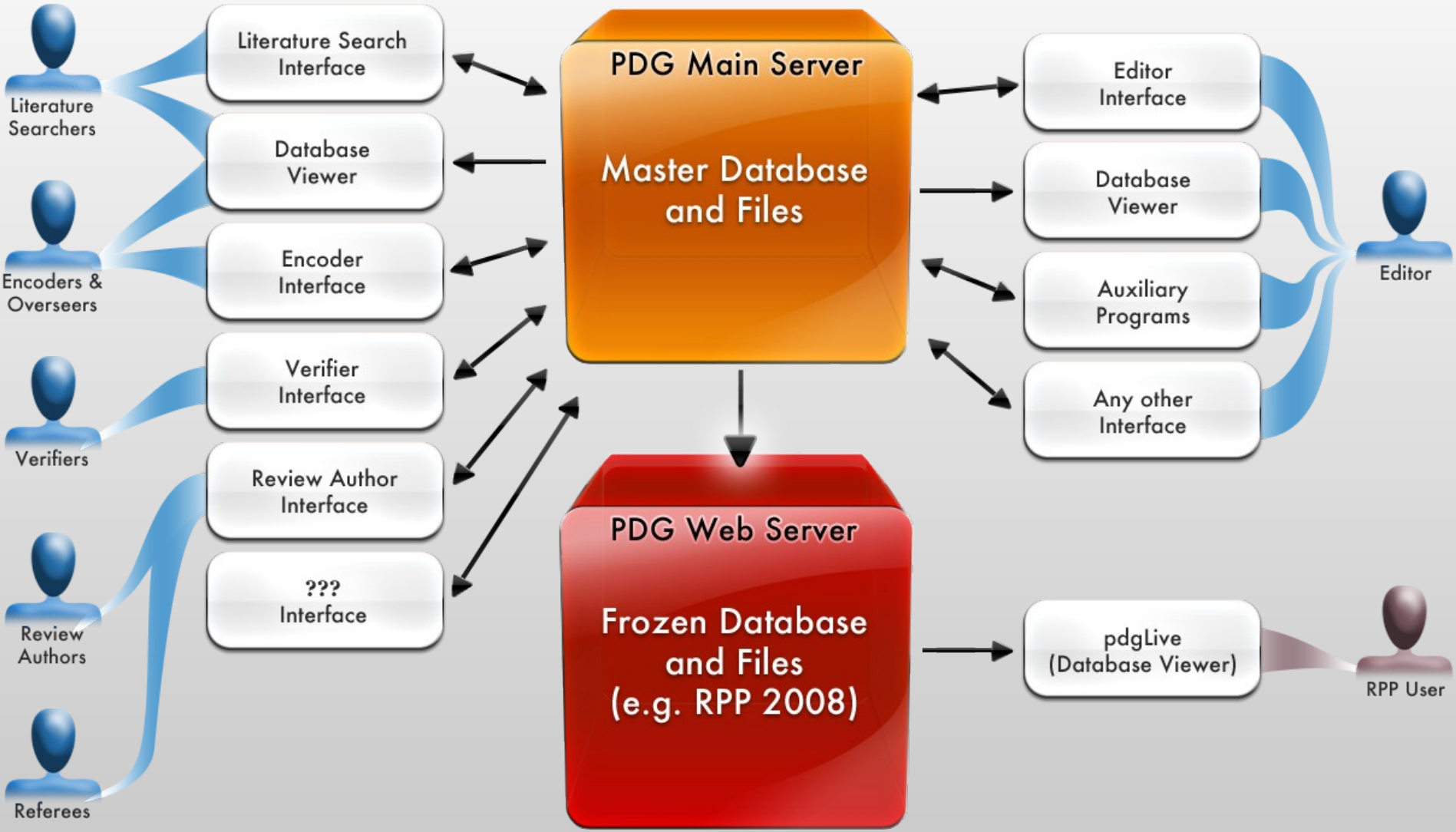
The PDG Product Ordering System allows anybody to request products from the Particle Data Group. These products include the Review of Particle Physics (a 1300+ pages thick book), the Booklet (about 300 pages), and a Pocket Diary. Other products have been available in the past, and may be available in the future. All products are shipped free of charge.

PDG currently distributes 16,000 copies of the big book, 31,000 booklets and 17,000 diaries. About half of these are distributed in Europe by CERN. Most of the big books are shipped directly from the publisher based on address lists we provide at the time the big book is published. This happens every 2 years. Some of the books, booklets and diaries are picked up at LBNL or CERN in person, others are

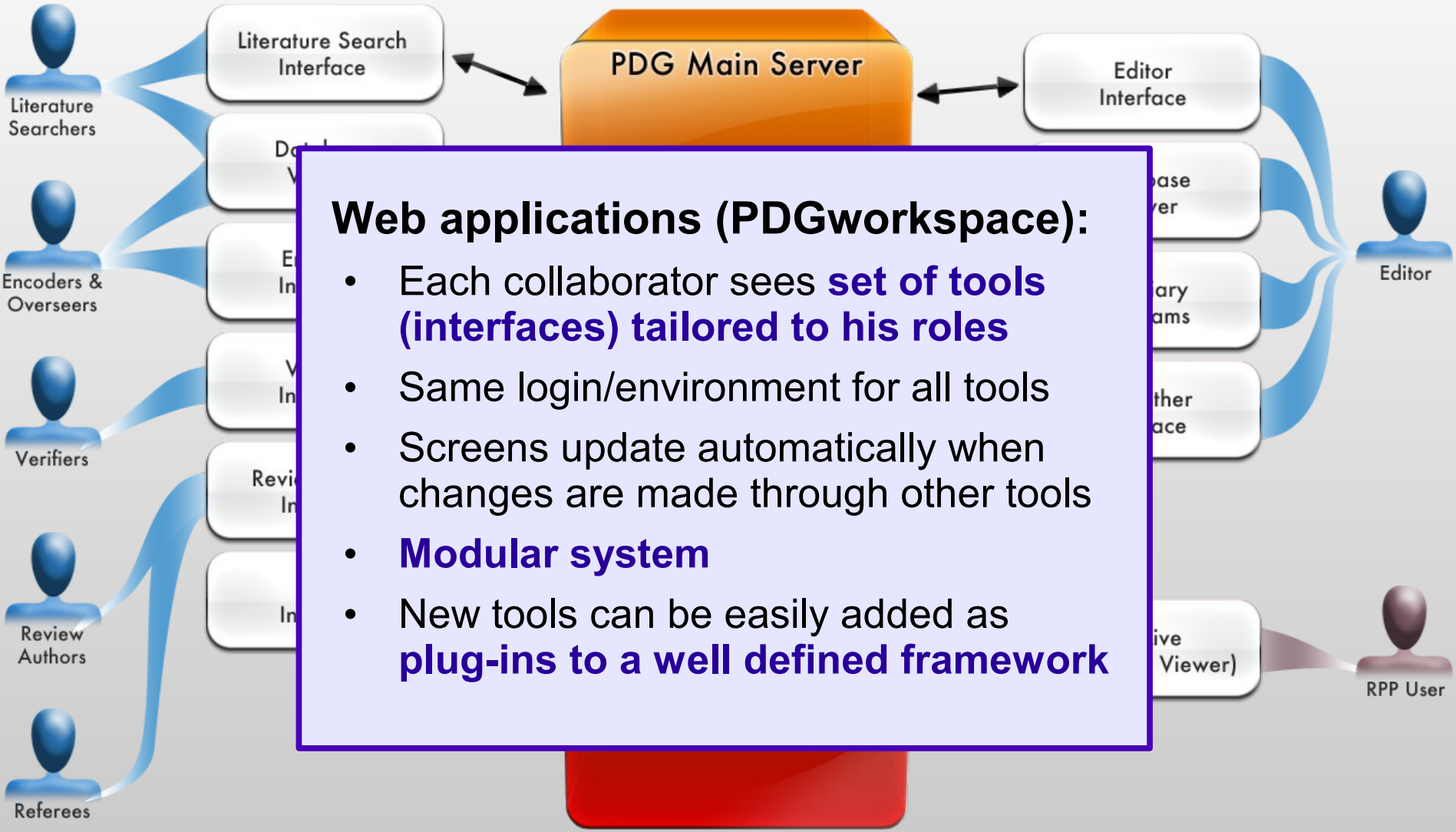
Important General Requirements

- **Production quality system – PDG data must be correct**
- **Workflow management**
  - System should keep track of who needs to do what and by when
  - One of the main improvements from new system
- **Task tracking**
  - PDG work generally consists of a set of well-defined tasks
    - Example: add the information from this paper to the Listings
  - System needs to keep track of scientific changes made for each task and ensure **traceability**
    - Changes for single task may happen over course of days, weeks or months, and are usuallly done by several persons in different UI sessions
- **Support for different output formats**
  - Must separate content from output medium and formatting
  - Implemented starting at database level by using “PDG macros”
  - TeX remains the fundamental format

High-Level Architecture



High-Level Architecture



Web applications (PDGworkspace):

- Each collaborator sees **set of tools (interfaces) tailored to his roles**
- Same login/environment for all tools
- Screens update automatically when changes are made through other tools
- **Modular system**
- New tools can be easily added as **plug-ins to a well defined framework**

Required Web Applications (I)

- **Encoder interface and literature search interface**
  - Future primary data entry interfaces
  - Task driven, easy-to-use tools for non-experts
  - By far our most complex application
  - Contains a large subset of the database viewer
- **Database viewer (pdgLive)**
  - Web-based application for browsing of database contents
  - Dynamically generates web-pages in format similar to RPP book
  - Used both for pdgLive (on published RPP edition),
  - And as tool to inspect new entries during encoding process
  - Provides direct links from RPP entries to SPIRES to actual papers

Required Web Applications (II)

- **Review interface**
  - Keep track of status and responsibilities for each review
  - Manage different versions during authoring and refereeing
- **Verifier interface**
  - Manage verification process and provide web page for verifiers to report their acceptance or corrections
- **Editor interface**
  - Expert-only web-based GUI to edit raw content of PDG database
  - Only used by editor
  - Diminishing role as most data entry tasks will be done decentralized through Encoder Interface
- **Reporting**
  - Reports on progress of Listings & Reviews

Required Web Applications (III)

- **Admin tools**
  - Configuration tool allows coordinators and editors to define users, assign responsibilities, etc
- **Ordering system, user profile management**
  - Users (including collaborators) can create a profile, order products, and update their address and preferences
  - This functionality is both available as preferences in PDGworkspace and as a separate stand-alone ordering system for the public (with more limited functionality)
- **Interface for updating institution data**

If needed later, additional applications can be added easily into the PDGworkspace framework

Required Programs & Scripts

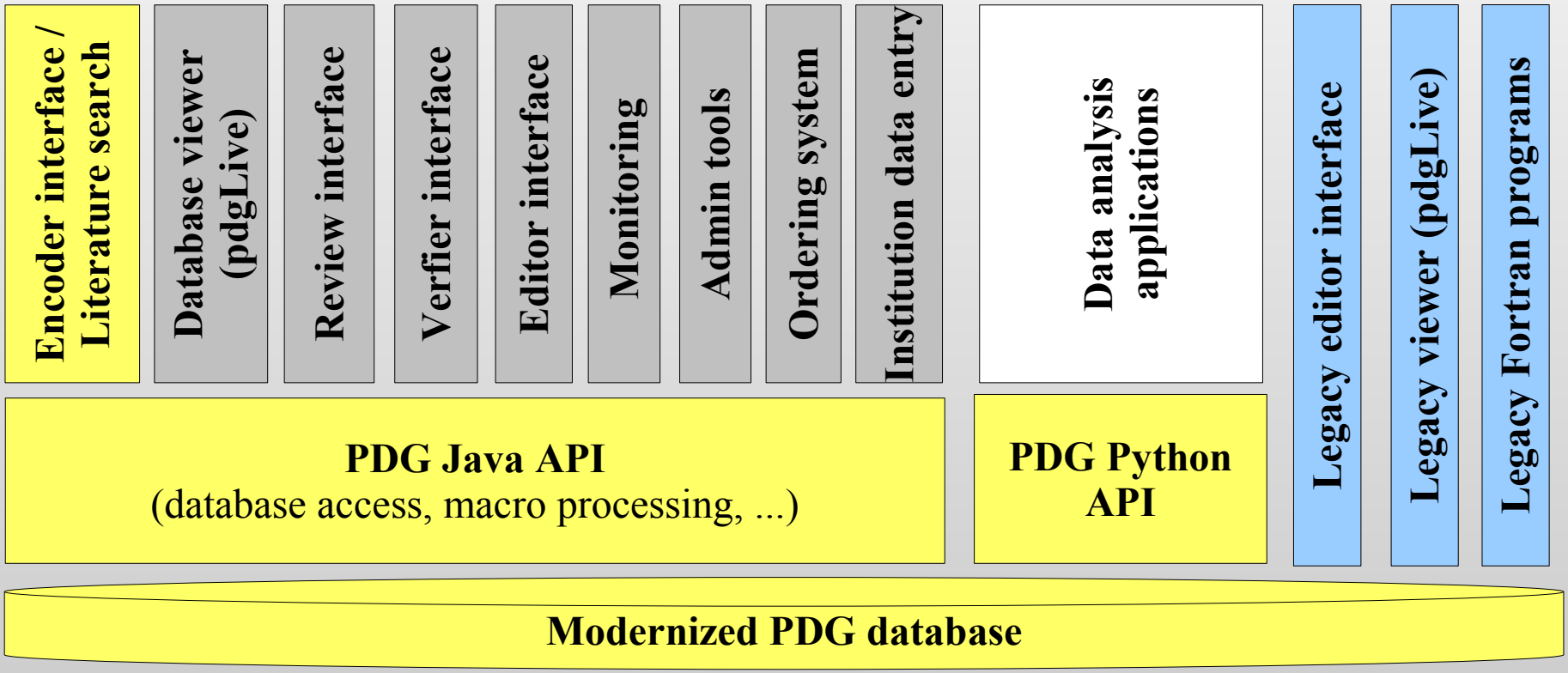
- **Data analysis environment**
  - Environment with both access to PDG data and to numerical algorithms, data analysis and graphics tools (for example ROOT, GNU Scientific Library (GSL), CERN libraries, ...)
  - Allows interactive access to PDG database
- **Auxiliary programs and scripts**
  - Fitting, averaging, graphics, production of TeX files for Listings
  - Used directly by editor, and indirectly through encoder interface
  - Ultimately based on above data analysis environment
- **System monitoring**
  - Scripts and web pages that alert us as early as possible to problems (e.g. web server down, low disk space, etc.)
- **Mailing system**
  - Interfacing of mailing system (mailman) to PDG database in order to automatically update various mailing lists

System and Components

= updated legacy applications (in V0 release)

= new components included in V0 release

= still to be implemented as part of upgrade (some partly done)

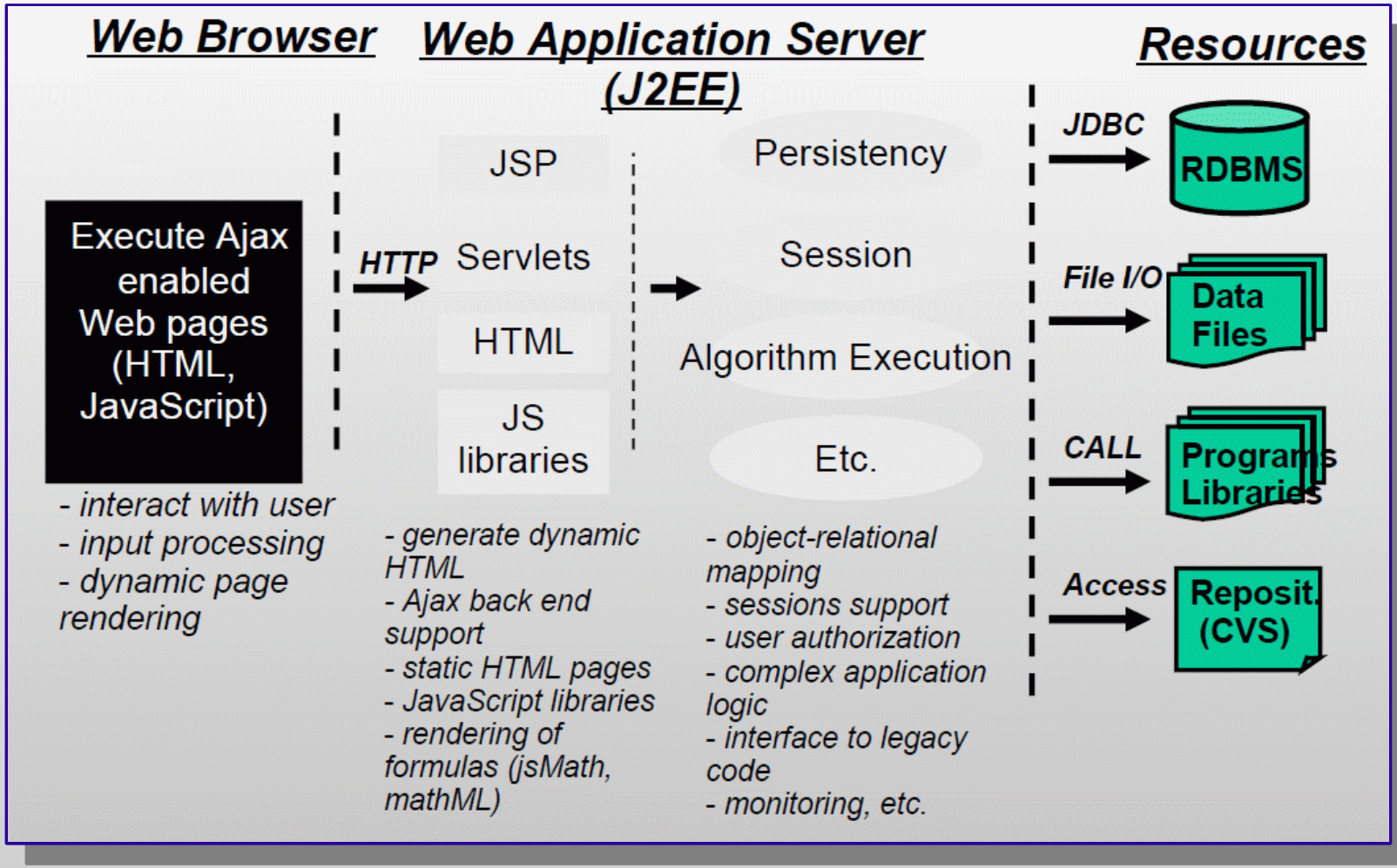


See later talks for more details on some of these components

Technologies

- **J2EE-based web application framework**
  - Commonly used industry standard for building scalable, distributed web applications
- **Ajax-enabled web pages**
  - User-friendly and highly interactive GUI behavior
- **Relational database (PostgreSQL)**
  - 130 database tables
- **Programming languages**
  - Java and JSP for web application framework backend
  - JavaScript and CSS for client-side HTML (Ajax)
  - Python API for programmatic access to database and to interface to numerical libraries and tools
  - Legacy Fortran applications restructured as libraries

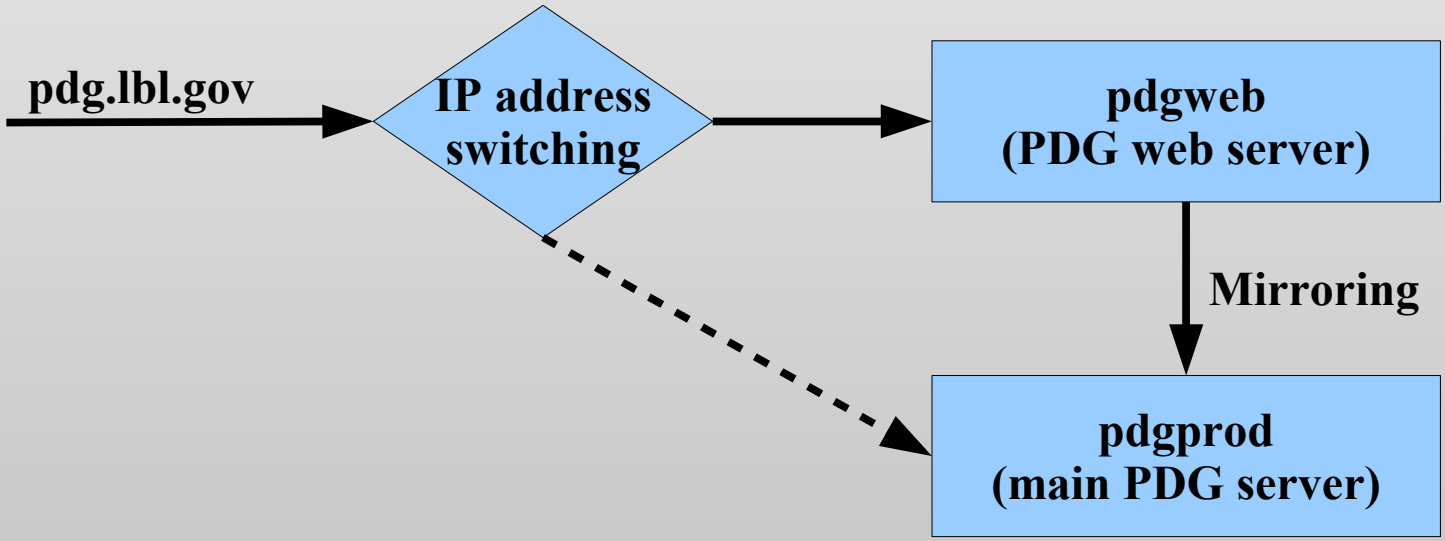
Three-Tier Web Application



Industry-standard way to build professional, highly interactive, maintainable web applications

Hardware

- **New modern Linux servers, each with**
  - 2 x Quad Core Opteron (AMD), 2.4GHz, 16GB DDR2 memory
  - 1 or 2 TB of RAID mirrored disk space
- **Redundancy failover scheme for web server**
  - Automatic switchover to backup web server running on pdgprod in case of a problem with PDG web server
  - Will be deployed as part of “pdg1 migration” (see project plan)



Cross-Linking with Other Systems

- **So far cross-linking between PDG and other systems (e.g. SPIRES/INSPIRE) has been extremely limited**
  - About to change with the new computing system
- **Wish list:**
  - A user looking at an entry in INSPIRE:
    "What data does PDG have about this?"
    - Entries in the Listings for related particles or particle properties
    - PDG review articles on related topics
  - A user looking at an entry in PDG:
    "What are the latest preprints / publications on this topic?"
  - *…*
- **Collaboration with colleagues from INSPIRE (Annette Holtkamp, Kirsten Sachs and others)**

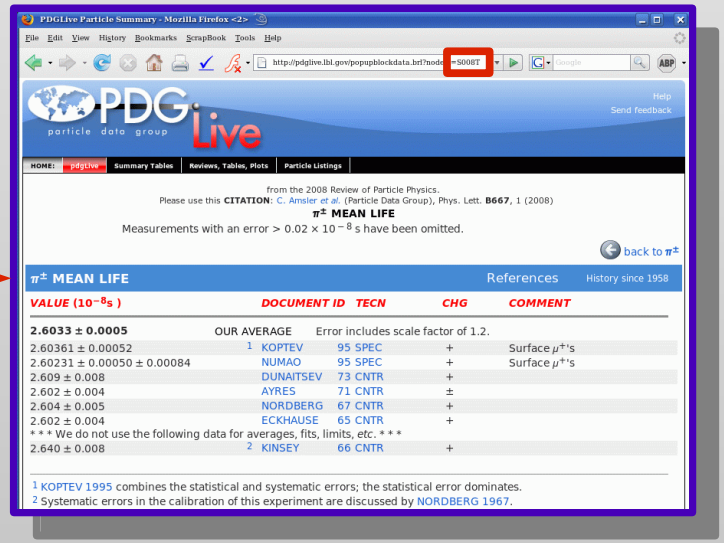
PDG Identifiers

- **Formalized PDG nodes into externally usable PDG Identifiers**
  - Strings w/o spaces of the form

    `[DATABASE::]NODE[:ATTRIBUTE=VALUE[,ATTRIBUTE=VALUE...]]`

    where
    - DATABASE: PDG database/RPP edition (optional)
    - **NODE: a PDG node (e.g. S008)**
    - ATTRIBUTE, VALUE: additional qualifiers (e.g. decay modes)
- **Examples:**
  - `S008` pi+-
  - `S008M` pi+- mass (MeV)
  - `S008:Desig=1` pi+ --> mu+ nu_mu
- **Can be used in many ways:**
  - Mapping to existing classification
  - **Use as "pointers" to PDG data**
  - ...

S008T →



HEP Taxonomy

- **Translation table between PDG Identifiers and HEP Taxonomy allows mapping of INSPIRE queries onto PDG data**
  - First results shown at Information Providers Summit IV (2010)

- **Examples:**

```
[PDGitem]
PDGcode = S044W
Description = Z WIDTH (GeV)
Query = "Z0: width"

[PDGitem]
PDGcode = S044:Desig=1
Description = Z --> e+ e-
Query = "Z0 --> positron electron"

[PDGitem]
PDGcode = S044Z0T
Description = A**(0,tau)(FB) CHARGE ASYMMETRY IN e+ e- --> tau+
tau-
Query = "electron positron: annihilation"  and "tau: pair
production"
or "electron positron --> tau+ tau-" and
("charge: asymmetry" or "angular distribution: asymmetry")
```

Example from mapping being worked out by INSPIRE team at CERN / DESY

INSPIRE Queries vs pdgLive

INSPIRE

Welcome to INSPIRE β. Please go to SPIRES if you are here by mistake.
Please send feedback on INSPIRE to feedback@inspire-hep.net

HEP :: HELP :: SPIRES HEPNAMES :: INST :: CONF :: EXP :: JOBS

Home > Search Results: "z0: width" and experimental results

Search: "z0: width" and experimental results — any field — Search — Browse

Search Tips :: Advanced Search

Sort by: latest first — desc. — times cited | Display results: 25 results — single list | Output format: HTML brief

HEP 586 records found 71 - 95 jump to record: 71 Search took 0.02 seconds.

71. **Precise determination of the Z resonance parameters at LEP: 'Zedometry'.**
(37) OPAL Collaboration (G. Abbiendi *et al.*). CERN-EP-2000-148, OPAL-PR-328. Nov 2000. 120 pp.
Published in **Eur.Phys.J. C19 (2001) 587-651**
e-Print: **hep-ex/0012018**

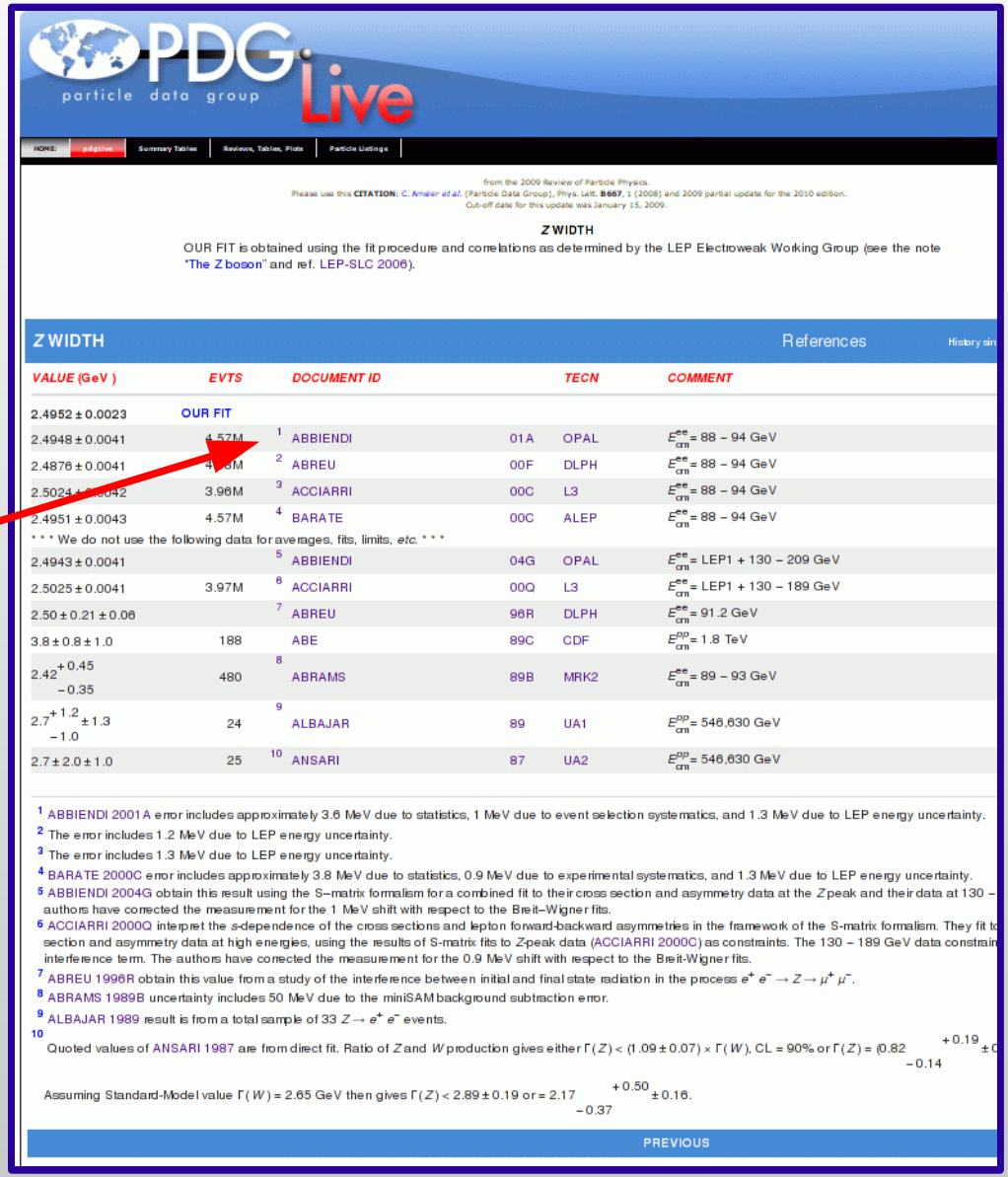
References | BibTeX | LaTeX(US) | LaTeX(EU) | EndNote
Abstract and Postscript and PDF from arXiv.org (mirrors: au br cn de es fr il in it jp kr ru tw uk za aps lanl)
Journal Server
CERN Server
Eur.Phys.J.C Server
pdgLive (measurements quoted by PDG)
Reaction Data (Durham)
Detailed record - Similar records - Cited by 37 records

72. **A Direct measurement of the Z0 invisible width by single photon counting.**
(37) OPAL Collaboration (M.Z. Akrawy *et al.*). CERN-PPE-90-187. Dec 1990. 25 pp.
Published in **Z.Phys. C50 (1991) 373-384**
Prepared for SPIRES Conference C91/03/03 (Moriond 1991:Electroweak:53-60)

References | BibTeX | LaTeX(US) | LaTeX(EU) | EndNote
Journal Server
CERN Library Record
Reaction Data (Durham)
Detailed record - Similar records - Cited by 37 records

73. **A Precision measurement of the number of neutrino species.**
(36) L3 Collaboration (B. Adeva *et al.*). L3-009. Jul 1990. 25 pp.
Published in **Phys.Lett. B249 (1990) 341-352**

References | BibTeX | LaTeX(US) | LaTeX(EU) | EndNote
Journal Server
ADS Abstract Service
Science Direct
Reaction Data (Durham)
Detailed record - Similar records - Cited by 36 records



PDG particle data group Live

HOME: pdgLive | Summary Tables | Reviews, Tables, Plots | Particle Listings

from the 2009 Review of Particle Physics.
Please use this CITATION: C. Amsler *et al.* (Particle Data Group), Phys. Lett. **B667**, 1 (2008) and 2009 partial update for the 2010 edition.
Cut-off date for this update was January 15, 2009.

Z WIDTH

OUR FIT is obtained using the fit procedure and correlations as determined by the LEP Electroweak Working Group (see the note "The Z boson" and ref. LEP-SLC 2006).

Z WIDTH References

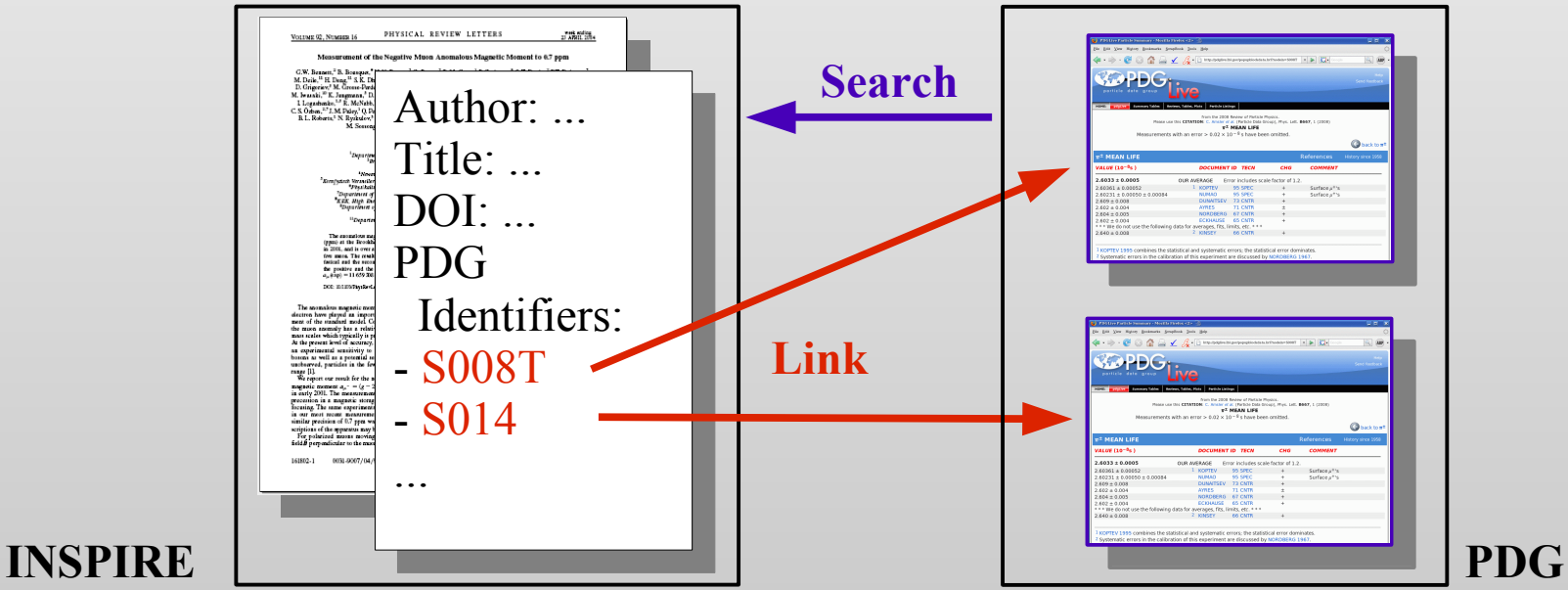
VALUE (GeV)	EVTS	DOCUMENT ID		TECN	COMMENT
2.4952 ± 0.0023	OUR FIT				
2.4948 ± 0.0041	4.57M	[1] ABBIENDI	01A	OPAL	E_{cm}^{ee} = 88 – 94 GeV
2.4876 ± 0.0041	4.[illegible]M	[2] ABREU	00F	DLPH	E_{cm}^{ee} = 88 – 94 GeV
2.5024 ± [illegible]	3.96M	[3] ACCIARRI	00C	L3	E_{cm}^{ee} = 88 – 94 GeV
2.4951 ± 0.0043	4.57M	[4] BARATE	00C	ALEP	E_{cm}^{ee} = 88 – 94 GeV
* * * We do not use the following data for averages, fits, limits, *etc.* * * *					
2.4943 ± 0.0041		[5] ABBIENDI	04G	OPAL	E_{cm}^{ee} = LEP1 + 130 – 209 GeV
2.5025 ± 0.0041	3.97M	[6] ACCIARRI	00Q	L3	E_{cm}^{ee} = LEP1 + 130 – 189 GeV
2.50 ± 0.21 ± 0.06		[7] ABREU	96R	DLPH	E_{cm}^{ee} = 91.2 GeV
3.8 ± 0.8 ± 1.0	188	ABE	89C	CDF	$E_{cm}^{p\bar{p}}$ = 1.8 TeV
$2.42^{+0.45}_{-0.35}$	480	[8] ABRAMS	89B	MRK2	E_{cm}^{ee} = 89 – 93 GeV
$2.7^{+1.2}_{-1.0} \pm 1.3$	24	[9] ALBAJAR	89	UA1	$E_{cm}^{p\bar{p}}$ = 546,630 GeV
2.7 ± 2.0 ± 1.0	25	[10] ANSARI	87	UA2	$E_{cm}^{p\bar{p}}$ = 546,630 GeV

[1] ABBIENDI 2001A error includes approximately 3.6 MeV due to statistics, 1 MeV due to event selection systematics, and 1.3 MeV due to LEP energy uncertainty.
[2] The error includes 1.2 MeV due to LEP energy uncertainty.
[3] The error includes 1.3 MeV due to LEP energy uncertainty.
[4] BARATE 2000C error includes approximately 3.8 MeV due to statistics, 0.9 MeV due to experimental systematics, and 1.3 MeV due to LEP energy uncertainty.
[5] ABBIENDI 2004G obtain this result using the S–matrix formalism for a combined fit to their cross section and asymmetry data at the Z peak and their data at 130 – authors have corrected the measurement for the 1 MeV shift with respect to the Breit–Wigner fits.
[6] ACCIARRI 2000Q interpret the *s*-dependence of the cross sections and lepton forward-backward asymmetries in the framework of the S-matrix formalism. They fit t section and asymmetry data at high energies, using the results of S-matrix fits to Z-peak data (ACCIARRI 2000C) as constraints. The 130 – 189 GeV data constrain interference term. The authors have corrected the measurement for the 0.9 MeV shift with respect to the Breit-Wigner fits.
[7] ABREU 1996R obtain this value from a study of the interference between initial and final state radiation in the process $e^+e^- \to Z \to \mu^+\mu^-$.
[8] ABRAMS 1989B uncertainty includes 50 MeV due to the miniSAM background subtraction error.
[9] ALBAJAR 1989 result is from a total sample of 33 $Z \to e^+e^-$ events.
[10] Quoted values of ANSARI 1987 are from direct fit. Ratio of Z and W production gives either $\Gamma(Z) < (1.09 \pm 0.07) \times \Gamma(W)$, CL = 90% or $\Gamma(Z) = (0.82^{+0.19}_{-0.14} \pm 0$
Assuming Standard-Model value $\Gamma(W) = 2.65$ GeV then gives $\Gamma(Z) < 2.89 \pm 0.19$ or $= 2.17^{+0.50}_{-0.37} \pm 0.16$.

PREVIOUS

PDG Identifiers as Tags

- **Include PDG Identifiers as tags into article metadata**
  - Lets INSPIRE point directly to relevant sections of PDG
  - Generated initial set of tags from PDG database
  - Could allow authors to tag their articles using a convenient GUI (similar to pdgLive) to find the relevant identifier



Conclusions

- **The new PDG computing system uses a modern, modular, web-based architecture and is implemented using industry-proven technologies**
  - Architecture proven by working V0 system
- **A combination of written requirements specifications, existing prototypes and close interaction with PDG ensures that the system being built does address our needs**
  - The set of components / interfaces being built addresses all aspects of current PDG work
  - Additional components could be easily added later if needed for future PDG work or requested by the HEP community
- **The new system allows far more extensive cross-linking with other systems (such as INSPIRE)**
  - Immutable PDG Identifiers as externally usable pointers to PDG data
  - Collaboration with INSPIRE on cross-linking
  - Other ideas under discussions